file
A/C [illegible]
Sicular, George M.

AGENDA MEMORANDUM

AGENDA DATE 6/10/75 ITEM NO. 10a UNIT Chief Engineer

ZONE________ PROJECT NO._______ NAME________

SUBJECT: Informational Item: "Reconnaissance Level Investigation on the Feasibility of Utilizing Surplus Water from Santa Cruz County as an Alternative Source of Supplemental Water for Santa Clara County"

EXPLANATION:

Attached is a copy of the final report by Professor George M. Sicular, Civil Engineering Consultant, on his study of the feasibility of using surplus water from Santa Cruz County as an alternative source of supplemental water for Santa Clara County. The report concludes that:

1. Waters surplus to the needs of Santa Cruz County do exist in various streams of Santa Cruz County.

2. While these supplies could possible be developed, it appears that the costs of development and the transmission of the water to Santa Clara County would be considerably above the cost of water from the San Felipe Project.

3. Officials, and probably the people of Santa Cruz County whom they represent, are suspicious of any move to share local waters with other areas.

4. If all other problems are surmounted, requirements for water, as laid down by environmental agencies, may make it impossible to divert more than small amounts of water from Santa Cruz County.

In the light of these conclusions, the report recommends:

1. Unless substantial support is forthcoming from Santa Cruz County and unless funding from State or Federal Governments, or both, is available, the District should make no further effort to develop water in North Santa Cruz County.

2. There appears to be advantages to the projects on the Pajaro River, and the District should look very carefully at them. If an investigation shows them to be feasible, the District should integrate them into the system. To do so would require extensive public discussions of the value of the project and, possibly, early purchase of reservoir sites.

George M. Sicular
Civil Engineering Consultant

16151 Azalea Way
Los Gatos, California 95030
(408) 356-2934

April 1, 1975

Mr. Robert T. Sapp
Chairman
Board of Directors
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118

Dear Mr. Sapp:

Attached herewith is the report that has been derived from the reconnaissance level investigation of the feasibility of utilizaing surplus water from Santa Cruz as an alternative source of supplemental water for Santa Clara County. This study was authorized by the Board of Directors of the District on January 14, 1975.

Sincerely,

George M. Sicular

George M. Sicular
Civil Engineering Consultant

GMS/ku
ATT.

George M. Sicular
Civil Engineering Consultant

16151 Azalea Way
Los Gatos, California 95030
(408) 356-2934

RECONNAISSANCE LEVEL INVESTIGATION OF THE FEASIBILITY OF UTILIZING SURPLUS WATER FROM SANTA CRUZ COUNTY AS AN ALTERNATIVE SOURCE OF SUPPLEMENTAL WATER FOR SANTA CLARA COUNTY

(April, 1975)

TABLE OF CONTENTS

Scope of Work 1

Estimates of Supply and Demand
Santa Cruz County 3

North Santa Cruz County 4

South Santa Cruz County 6

Santa Cruz County (as a whole) 8

Institutional and Public Constraints 9

Conclusions 10

Recommendations 12

Postscript 13

Bibliography 16

The Board of Directors of the Santa Clara Valley District, at the meeting on January 14, 1975, authorized a reconnaissance study of the feasibility of using surplus water in Santa Cruz County as an alternative source of supplemental water. This report deals with Phase One as defined below in the Proposed Scope of Work.

PROPOSED SCOPE OF WORK

The work will consist of a reconnaissance investigation of the feasibility of utilizing surplus water from Santa Cruz County as an alternative source of supplemental water for Santa Clara County. The work will be conducted in two phases, authorization to proceed with Phase Two being contingent upon the result of Phase One,

Phase One will consist of (1) a review of past studies of water supply and demand in Santa Cruz County and, where necessary, a reconnaissance type updating of amounts and costs, for use in determining the location and amount of water surplus to the local needs that may be available for export and; (2) a determination of the general location and amount of any water supplies surplus to the needs of Santa Cruz County and a commentary on any institutional, public, or environmental constraints which may prevent or limit the export of such surplus supplies to Santa Clara County.

The review of past studies will include discussions with appropriate local agencies and organizations in order to evaluate the institutional, public, and environmental constraints that may be involved. This information will be detailed in a written report which will also recommend a definitive scope of work for Phase Two.

Phase Two, if authorized on the basis of the results of Phase One of the work, will include at least the delineation, on a reconnaissance level, of a basic system for capturing and delivering surplus water to both North and South Santa Clara County, the system construction, operation, maintenance, replacement, power and incremental unit costs, a preliminary environmental assessment of the direct system impacts, and a written report with appropriate conclusions.

In accordance with instructions as noted in the Scope of Work, and with the assistance of officials in Santa Cruz County, conferences were held with the Santa Cruz Water Advisory Committee and discussions were undertaken with the managers of the larger water agencies. Meetings were also held with representatives of several engineering firms and the San Francisco District U.S. Army Corps of Engineers, all of whom are now, or were in the past, involved in planning water supplies for the County of Santa Cruz. Reports of many past studies were reviewed. The results and recommendations of this investigation are reported below.

Estimates of Demand and Supply for Santa Cruz County

Officials involved in planning for the County do not expect great increases in demand for agriculture or industry. The bulk of new water required in the future will go to meet the needs of an expanded populace. Population projections made in 1950-1970 period were based upon the assumptions of considerable inflows of people, commerce and industry. These assumptions were used by the joint venture team of Creegan & D'Angelo-McCandless, Consulting Engineers, in its 1968 report, "1968-2020 MASTER PLAN WATER DEVELOPMENT". Estimates of demand by this team (CDM henceforth), were based upon the following estimates for the year 2000: North County 247,000; South County 56,000; County total 303,000. These figures have been revised downward[1] as follows: North County 177,000;

---

[1] Santa Cruz Planning Department 1975

South County 73,000; Total County 250,000. Thus, the County with a population currently estimated at about 140,000, is expected to grow at an average rate of 2.3% per year during the next quarter century.

North County

CDM estimated demand for the year 2000 as 50,000 af./yr.. Based upon revised population projection, demand will be about 37,000 af./yr.. Currently, the annual consumption is about 20,000 af./yr.. New supplies of about 17,000 af./yr. will be required. CDM recommended developing additional ground water in the amount of 7,000 af./yr.. This leaves 10,000 af./yr. to be developed from surface waters.

CDM estimated firm supplies of unused surface water in the North[2] at between 65,000 and 76,000 af./yr.. Thus, there will be a firm amount of at least 55,000 af./yr. unused after meeting the needs of North Santa Cruz County. Because of possible misunderstanding it is important to clarify the terms "firm supply" and "firm yield." They mean the maximum amount of water that would be available in the worst year of the driest period of record. CDM, in its analysis, has computed for each and every proposed reservoir, estimates of its firm yield. As noted above in the discussion of revised projected demand, approximately 10,000 af./yr. would be required from the 65,000 af./yr. firm yield of currently unused water. It should be clear that only the 10,000 af./yr. actually required needs to be firm in order to protect Northern Santa Cruz County against possible drought. Counties such as San Benito, Santa Clara, and Santa Cruz each have at least two separate sources of water, i.e., surface and ground water. The aqueducts, South Bay and Hetch Hetchy, provide Santa Clara with a third source. For this situation no single source needs to be firm in itself. It is important in a dry year that the combination of these supplies should be adequate. If reservoir yields of currently unused water in Santa Cruz County had been computed on average instead of firm bases, the amount would be about 80,000 to 90,000 af./yr.. This being the case, facilities developed jointly by the two Counties, Santa Cruz and Santa Clara, could be operated to insure the required firm supply for Santa Cruz. The surplus remaining would be between 70,000 to 80,000 af./yr.. Not all of this water would be available for human use since some would be required for fish releases and possible low flow augmentation.

---

[2] Creegan & D'Angelo-McCandless "1968-2020 MASTER PLAN WATER DEVELOPMENT FOR SANTA CRUZ COUNTY - Summary and Recommendations" Vol. II, February 1969, pp. 59-64

	Presently Unused Surface Water Supplies - North Santa Cruz County in Units of 1,000 af./yr.	
Source	Firm	Average
Waddell Creek	15	20
Scott Creek	16	20
San Lorenzo River	30	33
Soquel Creek	15	17
Totals	76	90

A further word of clarification is necessary. The amount of water labeled unused is much smaller than the difference between the sum of total of runoff from surface streams and the amount presently utilized. The total runoff from all streams in the Northern part of the County is about 280,000 af./yr.. If unused surface supplies had been computed on this basis, the total would be about 250,000 af./yr.. The San Lorenzo River provides a good example of this point. Average annual flow exceeds 100,000 af./yr.. This amount alone exceeds the average yield of unused water noted above. However, the total yield from this source is limited to about 30,000 af./yr. or less because (a) the best reservoir sites have been used for homesites and (b) several branches of the river must be left open for fish and other environmental needs.

South County

The South County, in contrast to the North, uses most of its water for agriculture. While there are modest expectations of population growth, agriculture is expected to remain by far the largest consumer of water.

The population projection for the Watsonville-Pajaro area used by CDM for the year 2000 was 58,000. The current estimate is about 62,000 which is about 6% higher. This difference in projections will make a minor difference in estimates of water requirements. The difference of 4,000 people would, if no land is taken from agriculture for housing these people, increase demand by less than 1,000 af./yr.. Of course, if some agricultural land was lost to housing, then it is quite likely that little or no additional water would be required.

There is a difference of opinion about the amount of water used in this area primarily because most of it is obtained from wells. The United States Geological Survey estimates current usage as 62,000 af./yr.. The United States Bureau of Reclamation figure was about 55,000 and CDM's estimate was about 75,000 af./yr.. In 1968 when CDM published its report it noted the differences and attributed them to unreliable information since most wells in the area were not metered. CDM believed there was a problem due to excessive pumping in the summers but indicated that the safe yield had not been exceeded since, in the long run, ground water levels had remained constant. The United States Geological Survey in its "Water Resources Investigations 9-74"[3] estimated average pumpage per year between 1963-1971 was 49,100 af./yr. with a long term ground water yield of 44,000 af./yr.. The average difference of 5,000 af./yr. between withdrawals and recharge (overdraft) doesn't appear to be much of a problem. What does appear to be serious is the increase in rates of withdrawals. Between 1968 and 1971, withdrawals increased from 50,000 af./yr. to 62,000 af./yr. This overdraft has caused water levels to fall and there is evidence, in a small area, of sea water intrusion. There is plenty of water in Santa Cruz County to offset this demand. Another possible source which is under consideration is reclaimed waste water from the cities of Santa Cruz and Watsonville. Water from these sources could be used for irrigation.

---

[3] Published in 1974

By way of conclusion of this section on water supplies in South Santa Cruz County it is important to note that there is very little development of surface water although there are a number of streams plus the Pajaro River which, in itself, has an average annual flow of about 110,000 af. (at Chittenden) and 125,000 af. (at the mouth). Further, most of the water that infiltrates the surface and percolates to the ground water basin ultimately flows out to the sea. CDM estimated total County use of ground water at about 80,000 af./yr.. CDM also estimated that between 15% to 20% of the rainfall infiltrated the ground. This amounts to a recharge that ranges between 140,000 and 180,000 af./yr.. Thus, at least 60,000 af./yr. of fresh water flows out to sea through the ground.

Santa Cruz County (as a whole)

From the preceding discussion it can be seen that the County has surpluses in surface waters both in the North and South. The unused amount in the year 2000 in the North is about 55,000 af./yr. on a firm basis and about 70,000 af./yr. on an average basis. In the South, the Pajaro River, the major portion of which lies outside the County, is at this time virtually untapped. Other than the Pajaro there is no source of supply that is large enough to be utilized by Santa Clara County. It is possible to develop on the average between 30,000 - 40,000 af./yr. by building Gilroy Dam on Uvas Creek, a diversion dam upstream of Chittenden, and possibly a pump storage facility on the Pescadero. These projects could control flows of water which, in the main, do not originate in Santa Cruz County.

The combined total ranges between 85,000 firm and 110,000 af./yr. on the average. The development of these supplies could bring substantial benefits in addition to supply. Reservoirs on branches of the San Lorenzo, on Soquel Creek and on the Pajaro could reduce floods significantly. During the dry portions of each year minimal base flows could be maintained. In addition, the lakes created would enhance recreational and aesthetic qualities of the Counties.

Institutional and Public Constraints

At the outset of this study it was clear there existed institutional and public constraints against the regional development of water in the tri-county area encompassing San Benito, Santa Clara and Santa Cruz. Officials in all three Counties have been awaiting the delivery of water through the San Felipe Project for up to thirty years. They have been apprehensive about embarking upon other alternatives for fear that such undertakings could lead to delays. Officials in Santa Cruz County are publicly opposed to exportation of water from the County. Privately, some are agreeable to investigating possibility for cooperation. They are particularly interested in benefits that might be derived by the people of Santa Cruz. The two major concerns are (a) the fear that the County would lose the rights to utilize its own water in a dry period for its own development and (b) excessive use of water, in order to meet the needs outside as well as within the County, may lead to damage to the ecosystems of the various rivers from which the water would be taken. These are reasonable concerns. However, agreements could be made between the participating Counties on operating procedures which would guarantee to Santa Cruz the water it may need when such need arises. Contracts of this nature could allay the first concern. The concern about ecosystems is serious but because the various agencies whose approval would be needed are very conscientious in protecting the environment, only projects that are compatible with the environment would be accepted.

Despite such arguments as these, officials will remain unconvinced until carefully worked out engineering plans are developed, operating procedures approved by authorities and approval obtained from environmental agencies.

Three additional constraints are (a) the currently used criteria for economic justification, (b) the problems inherent in delaying acceptance of Federal support, that has already been obtained, in favor of possible support in the future for alternative projects and, (c) the attractiveness of Federal financing which greatly reduces the need for local bond issues.

Conclusions

1. The amount of surface water in Santa Cruz that could be conserved is substantially greater than projected demand, at least until the year 2000. Certain projects, such as the Lower Soquel Creek Dam and Reservoir, were investigated and found feasible for local development. However, it appears that the added expense of transmission of water to Santa Clara County would drive total costs well above the costs of water from the San Felipe Project.

2. Officials, and probably the people in Santa Cruz whom they represent, are suspicious of any moves to share local waters with outsiders. This is, of course, in conflict with desires to import water from other counties when it is advantageous to do so. Be that as it may, the problem exists and it would take many years of effort to change these attitudes.

3. If all other problems are surmounted, requirements for water, as laid down by environmental agencies, may make it impossible to divert more than small amounts of water from Santa Cruz County.

4. The dams and reservoirs on the Pajaro and its branches near Gilroy, Chittenden, and Pescadero are probably feasible. They would conserve between 30,000 - 40,000 af./yr. and provide flood control, recreation, and low flow augmentation benefits to the region. The U.S. Army Corps of Engineers is currently proposing to build levees to protect Watsonville from flooding by the Pajaro River. The lowest cost alternative is estimated at $15 million. Substantial amounts are also required to protect the Gilroy area. The dams at Gilroy and Chittenden could provide considerable protection to these cities.

Recommendations

In light of the foregoing, the following recommendations are advanced:

1. Unless substantial support is forthcoming from Santa Cruz County and unless funding from the State and/or the Federal Government is available, the District should make no further effort to develop water in North Santa Cruz County.

2. There appear to be advantages to the projects on the Pajaro and the District should look very carefully at them. If an investigation shows them to be feasible, the District should integrate them into the system. To do so, would require extensive public discussions of the value of the projects and, possibly, early purchase of sites.

Postcript - Other Considerations

Current thinking in the field of decision-making leaves little room for such considerations as the long-term future. Economic analysis is based upon the present worths of all present and future benefits compared to the present worth of all future costs. Present worth is the discounted worth today of a benefit to be received or cost to be expended in the future. Since on public works projects most costs are incurred early and benefits are received in the future, projects that have high benefit cost ratios are those on which "quick killings" can be made. This is so because discounting a benefit to be received a significant time in the future greatly depreciates its present worth, as the following example will show. Find the present worth of $1,000.00 to be received 10 years, 20 years, and 50 years hence at rates of interest of 3% and 6%.

Interest Rate	TIME		
	10 Yrs.	20 Yrs.	50 Yrs.
3%	744	554	228
6%	558	312	54

The table shows clearly that the benefits our children and their children would receive have very little meaning to us when we use present worth criteria. Therefore, we must find new criteria which will give greater concern for our descendants.

Conventional Benefit - Cost methods have been responsible for seeking out the most readily obtained resources and exploiting them as rapidly as possible with little regard for long range needs. We are learning from current shortages of oil and gas that quick profits alone do not insure a strong America in the future.

Similarly, in developing water resources, we have looked for the cheapest supplies and neglected other available sources. The consequences of these actions will be far reaching. For example, in ignoring local water, such as that which is available in the Santa Cruz Mountains, in favor of water from the Delta, we deny to areas with no alternative sources the water to which we lay claim. We also contribute to stressing the ecosystem of the Delta. Furthermore, in deferring construction of local projects now, we may lose the opportunity to develop them later because, as has been the case in the San Lorenzo Valley, the best sites may be used for other purposes.

This is a problem not only for local authorities but for State officials as well. The State should assist in the planning and financing of local projects for the reasons noted above.

Another matter has come to light because of changing patterns of agricultural use of water in South Santa Clara, South Santa Cruz, and North San Benito Counties. I refer to changed practices which have increased demand for water beyond the safe yield of local water sources. Do all withdrawers, particularly from ground water, have the unchallenged right to utilize as much water as they wish with no regard for the overall supply? The Districts concerned might give serious consideration to creating cooperatives for users of each aquifer with the objective in mind of limiting withdrawals equitably so as to protect the resource. In very lean years some users, by prior arrangement, might not plant crops in return for payment from those who continue to pump and are thus able to obtain good yields. The Santa Clara Valley Water District, by utilization of pump charges, has moved to protect ground water basins. This measure is commendable but, in the long run, will probably be inadequate in itself.

The Santa Clara Valley Water District operates in accordance with established practices and hence, the foregoing discussion is not intended to imply that its performance is not up to standards achieved by other Districts. Actually, its performance is probably better than most.

The purpose of the discussion is to encourage authorities to adjust to changing circumstances which will require new criteria and to apply them wherever they may be feasible. Further, we know that we are not independent since we import water from other areas. This being the case, we should also concern ourselves about how local actions can aid or hinder people who live in other areas.

BIBLIOGRAPHY

Report of Geologic Investigation of Zayante Creek Dam Site	June, 1968	Bechtel Corporation San Francisco, CA
Zayante Reservoir Interim Report on Reservoir Yield with Variable Fish Schedule	December, 1973	Bechtel, Inc. San Francisco, CA
Engineering Study of Coast Water Supply System, Santa Cruz County, California	May, 1959	Brown & Caldwell Consulting Engineers San Francisco, CA
Water Supply & Distribution City of Santa Cruz	1963	(ditto)
Groundwater Elevation Charts Bonnie Doone Quarry Pacific Cement & Aggregates		Manning W. Cox Associates Consulting Geologists San Francisco, CA
Report of Santa Cruz County Master Plan of Water Development & Preliminary Design of the First Increment of Work for Santa Cruz County Flood Control & Water Conservation District	January, 1957	Creegan & D'Angelo Civil Engineers San Jose, CA
Report on Water Supply, Transmission & Distribution Systems for the San Lorenzo-Scotts Valley Zone	May, 1958	(ditto)
Report on the Development of the Water Resources of the Bonnie Doone Zone	April, 1959	(ditto)
Interim Report on Soquel Project	May, 1960	(ditto)
1968 - 2020 Master Plan Water Development for Santa Cruz County Volumes I & II	June, 1968	Creegan & D'Angelo and McCandless San Jose, CA
1968 - 2020 Master Plan Water Development for Santa Cruz County Summary & Recommendations	February, 1969	(ditto)

City of Santa Cruz Groundwater Utilization-Development & Treatment	11/25/70	Kingman Engineers
Soquel Creek County Water District - An Analysis of Water System Requirements	June, 1970	Charles S. McCandless Co. Consulting Engineers
Report on Ground Water Conditions-Pajaro Valley Monterey-Santa Cruz Counties	For Water Year 10/1/70 to 9/30/71	Monterey County Flood Control & Water Conservation District
Santa Cruz - Monterey Counties Investigation Bulletin No. 5	August, 1953	State of California Water Resources Board Sacramento, CA
Water Resources of California Bulletin No. 1	1951	(ditto)
San Lorenzo Valley County Water District Water Study	January, 1970	Mark Thomas & Co. Civil Engineers & Surveyors San Jose, CA
Preliminary Workshop Master Plan Development	February, 1975	(ditto)
Ground Water Hydrology of the Bonnie Doone Quarry Site, Santa Cruz County, California	1/4/63	David K. Todd Consulting Hydrologist Berkeley, CA
Survey Report for Flood Control and Allied Purposes Soquel Creek, Santa Cruz County, California	July, 1966	U.S. Army Engineer District, San Francisco Corps of Engineers
Geohydrologic Reconnaissance of the Soquel-Aptos Area, Santa Cruz County, California	1967	U.S. Department of the Interior-Geological Survey Menlo Park, CA

Ground Water in the Scott's Valley Area Santa Cruz County, California Open-File Report	7/24/69	U.S. Geological Survey (J.P. Akers) Menlo Park, CA
Geology and Ground Water of the Pajaro Valley Area-Santa Cruz & Monterey Counties	June, 1972	U.S. Geological Survey (K.S. Muir) Menlo Park, CA
Sea Water Intrusion, Ground Water Pumpage, Ground Water Yield, and Artificial Recharge of the Pajaro Valley Area	October, 1974	U.S. Geological Survey